Scientific Annals of Economics and Business
67 (2), 2020, 177-192

Gender Diversity in Boardrooms and on Supervisory Boards and its Relation to Stock Prices

Marie Ligocká*

Abstract

Despite the fact that the labour force participation rate of women declined in the company bodies of publicly traded companies in 2017, there has been a growing representation of women in these positions in Europe. The representation of women is important due to the use of available human resources, the improvement in the quality of human capital and the positive effect on economic development. Gender imbalance in the management and supervisory bodies of publicly traded companies can be associated with lower management effectiveness, a decision-making quality that can influence the business situation of companies, which could be related to stock price development. Thus, this paper is focuses on examining the relationship between gender diversity in boardrooms and on supervisory boards and the stock prices of selected European publicly traded companies. The results show that there are dissimilar relations between stock prices and gender variables among the sectors and countries analysed.

Keywords: Gender equality, Stock prices, Boardroom, Supervisory board, GMM method.

JEL classification: C58, G34, J16, O52.

1. INTRODUCTION

Generally, the global labour force participation rate of women and men declined in 2017. However, women were on average less likely than men to participate in the labour force because women's labour force participation rate was 48.068 % in 2017, a decrease from 50.193 % in 2005 due to structural barriers and cultural restrictions; moreover, an increase in the number of years' women spend in school was accompanied by a lack of employment opportunities, particularly for young women. The labour force participation rate of males was 75.023 % and declined from 77.273 % in 2005. However, the situation of participating women in the countries analysed, namely, Poland, Austria and Germany, is typical of growing trends. The labour force participation rate of women was 54.869 % in

* Department of Finance and Accounting, School of Business Administration in Karviná, Silesian University in Opava; e-mail: *ligocka@opf.slu.cz*.

Austria in 2017, and 50.668 % in 2005; it was labour force participation rate of women in Germany was 55.212 % in 2017 and 50.701 % in 2005; and the labour force participation rate of women in Poland was 49.151 % in 2017, rising from its rate of 47.788 % in 2005. The labour force participation rate of males was 66.3442 % in Germany in 2017, reflecting a slight decrease from its rate of 66.713 % in 2005. Slight growth was also detected in the labour force participation rate of males in Austria; the rate was 66.153 % in 2017 and 66.129 % in 2005. Similarly, Poland showed an increasing trend in the labour force participation rate of males, rising from 63.029 % in 2005 to 65.852 % in 2017 (Catalyst, 2019; The World Bank, 2019).

Despite this progress, women are scarce among senior leaders because very few women are present in the boardrooms or are members of supervisory boards of the world's largest corporations. Women account for less than a quarter of senior roles globally. Women are gradually gaining representation on executive committees but still comprise a small minority. For example, in Europe, the proportion of women on executive committees was approximately 15 % in 2017; however, a considerable contribution to this value is existence of quotas for women on the boards of public companies in some European countries (Catalyst, 2019; The World Bank, 2019). Although gender diversity is analysed because discrimination against women limits the ability to use available human resources, the disproportionate representation of women reduces competition in the labour market, increases pressure to improve the quality of human capital and has a negative impact on economic development. In particular, the lack of gender diversity limits the development of an economy based on modern technologies and a high level of added value. Gender imbalances in the management and supervisory bodies of publicly traded companies can also be a missed opportunity for governance, management and performance, as lower female representation in top management positions reduces management efficiency and decision-making quality. Indeed, there are still obstacles that women face in their professional advancement to the highest management positions in companies. As a result of cultural institutions and mental abilities, women exhibit management methods that are consistent with the requirements of teamwork, communication, empathy and foresight associated with ethical behaviour. These characteristics are essential for long-term successful company strategies, because only mixed teams can take advantage of the synergistic effect of a culturally modified problem-solving approach. It is desirable to create foster optimal climate that could reduce the adverse effects of consumer thinking and increase transparency, business stability and the ethics of interpersonal relationships (Zdeněk and et al., 2014).

Corporate governance, where gender equality can be included on boards, can represent a factor that can impact stock prices according to the theory and empirical literature. Higher attention to corporate governance is associated with the bankruptcy of corporations that falsified their accounting; for example, the best known are the scandals of the US companies Enron and WorldCom or the Italian company Parmalat. In the case of complicated business structures (corporations), which may be associated with a complex orientation in the structure of organization and reduced transparency, there can be some risks, such as financial problems and frauds or economic crime. Due to efforts to reduce risks there are legislative regulations in individual countries or supportive voluntary self-regulatory instruments, such as corporate governance codices. Corporate governance codices give mainly publicly listed companies a set of voluntary rules to help them establish good

corporate governance and control systems; the goal is to increase transparency for all stakeholders. The corporate governance codices highlight the obligation of boardrooms and supervisory boards to ensure the continued existence of the company and its sustainable value creation in line with the principles of the social market economy. One of the topics defined in corporate governance codices is gender diversity. Gender diversity could be a variable that can affect stock prices due to the benefits associated with female representation. For example, Dezso and Ross (2012) argue that female representation in top management brings informational and social diversity benefits to the top management team, enriches the behaviours exhibited by managers throughout the firm, and motivates women in middle management. Furthermore, Campbell and Minguez-Vera (2008) show that the gender composition of boards can affect the quality of the monitoring role; thus, the financial performance of the firm or the significant impact of female directors on board inputs and firm outcomes confirm the findings of Adams and Ferreira (2009).

Given the above information, the objective is to examine the relationship between gender diversity in boardrooms and on supervisory boards and the stock prices of selected publicly traded companies. The paper consists of several parts. A review of the literature follows the introduction. Then, the data and methodology, results and discussion sections are presented. The paper is closes with the conclusion.

2. REVIEW OF THE LITERATURE

Diversity, especially gender diversity, and its relation to stock prices are widely discussed in the empirical literature. For example, Adams and Ferreira (2009) examined the impact of the proportion of women in boardrooms on firm performance. The authors investigated data from 1,939 companies included in the S&P 500, S&P MidCap and S&P SmallCap indexes in 1996 – 2003. The findings prove that the representation of women in leading positions has an impact on the outputs of companies and the monitoring of companies. However, the average effect of gender diversity on firm performance is negative due to the lower number of takeover defences and due to the existence of quotas for female representation in leadership positions in companies, which could lead to over-monitoring in those companies. They also stated that gender diversity has a positive effect on stock prices in companies with weak governance, where there is space for better company performance but were the negative impact is associated with companies with strong governance. The negative impact of gender diversity is also confirmed by Dobbin and Jung (2011), who focused on the relationships among the representation of women on the boards of companies, earnings and stock prices. They analysed data from 432 companies involved in the Fortune 500 in 1997 – 2006. Dobbin and Jung (2011) argued that gender diversity has no effect on earnings but that gender diversity has an impact on the stock prices of companies, which is attributed to the fact that institutional investors could sell stocks of companies in which women occupied leadership positions, not due to lower profits but due to bias towards women in those positions.

In contrast, with the findings of Adams and Ferreira (2009) and Dobbin and Jung (2011), Gul *et al.* (2011) verified the existence of a relationship between gender equality and stock prices using 5,021 observations from selected US companies in 2001 – 2007. Their results show a positive impact of gender diversity on boards and stock prices. According to Gul *et al.* (2011), the positive effect of gender diversity is associated with improving stock

price informativeness by increasing voluntary public disclosures in large firms and increasing the incentives for private information collection in small firms. Furthermore, they detected that the association between female directors and stock prices is weaker for firms with higher earnings quality and greater institutional ownership. With respect to the ambiguity of the relationship between gender problematics and stock returns Wolfers (2006) analysed the gender diversity of CEOs and their relation to stock returns. Wolfers (2006) used companies included in the S&P 1 500 in 1992 – 2004. He assumed that if female-headed firms were systematically underestimated, this would suggest that female-headed firms would outperform expectations, yielding excess returns. However, the results do not confirm systematic differences in stock returns in female-headed firms, although this result reflects the weak statistical power of our test, rather than a strong inference that financial markets either do or do not under-estimate female CEOs.

In addition to the effect of Asian and US stock markets on European stock markets, there is an analysed impact of gender equality on stock prices that Ahern and Dittmar (2012) investigated; they focused on the relationship between the higher representation of women on the boards of companies and stock prices. They used data from 248 companies listed on the Norway stock exchange in 2001 – 2009. An important event that influenced the results was the 2003 law requiring 40 % of women to serve as CEOs. The introduction of this quota caused a sharp decline in stock prices, as well as profits in the coming years, which is consistent with the idea that businesses choose the composition of boards in such a way as to maximize the value of the company. The quota led to the creation of boards with younger female members who had less work experience than the existing male members, which also resulted in increased leverage effects, a higher number of acquisitions and deterioration in operating performance. The negative effect of female representation on stock prices was also detected by Ahern and Dittmar (2012) and Haslam *et al.* (2010). Haslam *et al.* (2010) investigated companies included in the FTSE 100 Index in 2001 – 2005. The results show that companies with only men on their boards had stock returns that were approximately 37 % higher than those of companies with women on their boards. This finding supports the hypothesis that women in leadership are considered weak and that their representation can lead to a decrease in company value. The findings also show that this claim is not in accordance with the actual performance of companies.

In contrast, in addition to Ahern and Dittmar (2012) and Haslam *et al.* (2010), Smith *et al.* (2005) used 2 500 Danish companies in 1993 – 2001 to determine the ambiguous impact of female representation in management. The findings show that the impact of female managers is positive, negative and unproven. The negative impact may be explained by the fact that a significant proportion of the women on boards have family ties to the owners. The results also show that the positive effects are mainly related to the proportion of female managers with a university degree, while female CEOs who do not hold a university degree have a much smaller or insignificant effect on firm performance. Furthermore, it seems that the members of the boards elected by employees have a positive impact on the performance of the company. The inconsistency of the results is as apparent as those of Smith *et al.* (2005), as well as in the case of Campbell and Minguez-Vera (2008), who analysed the impact of gender diversity on the stock prices of 68 companies listed on the Madrid Stock Exchange in 1995 – 2000. Their results via non-parametric tests show that stock prices positively reflect the presence of women in boardrooms. However, if parametric tests are used, the result did not show a relationship between the presence of women in the

boardrooms and stock prices. The findings show that there can be differences in the results depending on the methodology used. The findings of the empirical literature show different relationships between stock prices and gender diversity, as Table no. 1 presents. The impact of gender diversity on stock prices was positive and negative, and there was also an unproven effect.

Table no. 1 - Summary of the analysed effect of gender diversity on stock prices

Author	Using method	Analysed period	Analysed countries	Proved linkages
Adams and Ferreira (2009)	Regression analysis	1996 - 2003	USA	Gender diversity/-
Ahern and Dittmar (2012)	Regression analysis	2001 - 2009	Norway	Gender diversity/-
Campbell and Minguez-Vera (2008)	Regression analysis, Event Study	1995 - 2000	Spain	Gender diversity/+, Unproven effect
Dobbin and Jung (2011)	Regression analysis	1997 - 2006	USA	Gender diversity/-
Gul *et al.* (2011)	Regression analysis	2001 - 2007	USA	Gender diversity/+
Haslam *et al.* (2010)	Regression analysis	2001 - 2005	Great Britain	Gender diversity/-
Smith *et al.* (2005)	Regression analysis	1993 - 2001	Denmark	Gender diversity/+, -, Unproven effect
Wolfers (2006)	Regression analysis	1992 - 2004	USA	Unproven effect

Source: Authors´ calculations. Note: + and – symbolize positive and negative impact of gender diversity on stock prices

3. DATA AND METHODOLOGY

I used 62 food, metallurgical, energy and chemical companies listed on selected European Stock Exchanges. In particular, there are 10 Austrian companies, 29 Polish firms and 23 German companies. The following criteria were defined to create the analysed sample: (1) The existence of corporate governance codices in each country is necessary because companies must exhibit formulated behaviour with respect to the statutory regulations; (2) It is important for most of the companies to have similar business profiles in accordance with the NACE classification for the transparency of results; (3) Due to the attainment of the required time series, the quotation on the individual stock exchanges had to be in 2005 at the latest; (4) An adequate number of companies was required for analysis; and (5) A dualistic internal structure system is required due to the focus on the composition of boardrooms and supervisory boards. These selections focused on three European countries, namely, Poland, Austria and Germany, and 62 companies listed on the stock exchanges of these countries.

Data on stock prices are from Yahoo Finance and stock prices are measured by the average of the daily values for each year due to the inclusion of stock price volatility during the whole year. The gender variables are defined in accordance with empirical literature,

e.g., Adams and Ferreira (2009); Dobbin and Jung (2011); Campbell and Minguez-Vera (2008); Gul *et al.* (2011); Haslam *et al.* (2010); Smith *et al.* (2005). I used annual reports and corporate governance reports. I used the percentage of women in boardrooms (PZP), the percentage of men in boardrooms (PMP), the percentage of women on supervisory boards (PZDR) and the percentage of men on supervisory boards (PMDR). I considered both the proportion of women in boardrooms and the proportion of women on supervisory boards to be important. Those in boardrooms make crucial decisions, support all strategic decisions of the company and consider the interests of stakeholders. Supervisory boards have a control function, e.g. check business activities, check for proper accounting, and check the financial statements and the proposal for the distribution of the company profit. Gender equality is important in the management and supervisory bodies of publicly traded companies due to the exploitation of opportunities for corporate governance and the performance of companies because according to the empirical literature, higher female representation is associated with higher effectiveness of management and decision-making quality, as argued by Zdeněk and et al. (2014).

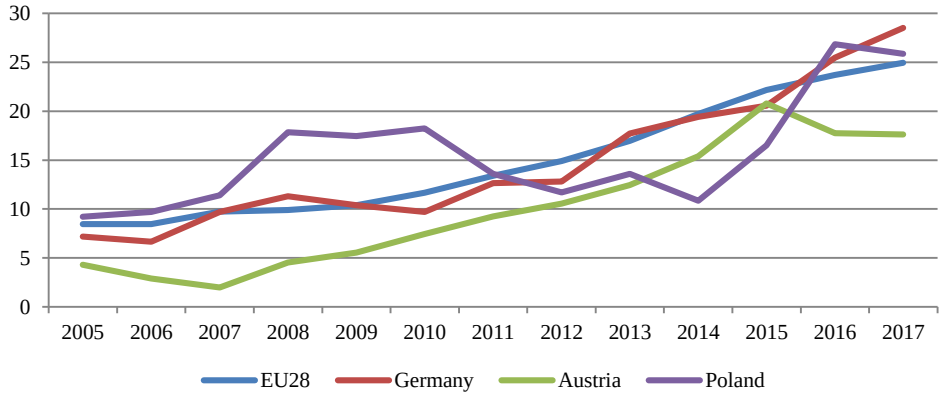

Figure no. 1 - Development of the Proportion of Women as Board Members (in %, NACE C-D)
Source: European Institute for Gender Equality (2019c), Authors´ calculations.

As seen in Figure no. 1, the representation of women on the boards of publicly listed companies shows a rising trend. The proportion of women on the boards of the largest companies listed in the European Union more than doubled the largest stable increasing trends of the countries under review recorded in Germany. However, significant changes were also detected in Poland and Austria. The progress is largely attributed to major legislative initiatives taken both at the national and European-Union levels and the extensive public debates in this area. In general, 60 % of publicly listed companies had more than one woman on their boards in 2017 but non-executive positions prevail. Despite significant changes, women are also heavily under-represented among the top-level positions in the largest companies in European Union countries; for example only 7 % of board chairs and only 6 % of CEOs are women (European Institute for Gender Equality, 2019b).

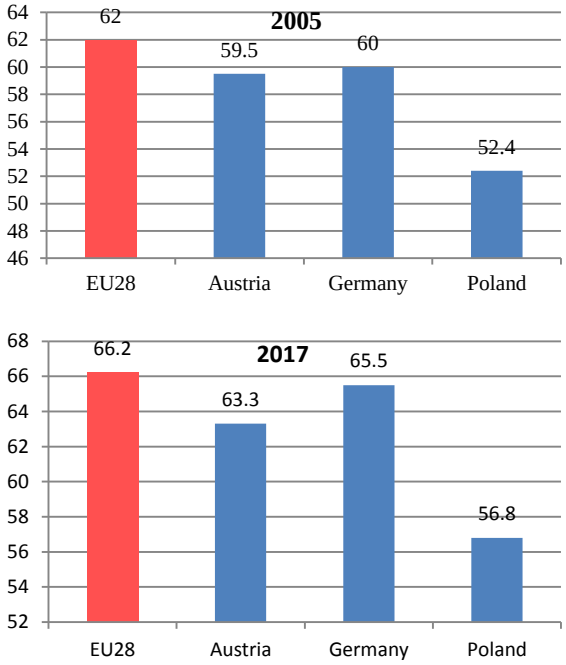

Figure no. 2 – Comparison of the Development of the Gender Equality Index (in %)
Source: European Institute for Gender Equality (2019a), Authors´ calculations. Note: 1 means total inequality and 100 means full equality.

The Gender Equality Index is used to measure gender equality in the European Union. In the interpretation, I focused on the domain of power because it is related most to the topic analysed. In Germany, the Gender Equality Index score was 65.5 in 2017, as Figure no. 2 shows. It is slightly lower than score of 66.2 in the European Union, but the average pace of progress is slightly faster in Germany than in the European Union. The largest improvement took place in the domain of power due to progress in women's representation in decision-making positions in the economic sector. The score for the domain of power demonstrates a marked increase due to a considerable improvement in the sub-domain of economic power. The representation of women on the corporate boards of publicly listed companies more than doubled (to 26 %) from 2005 to 2015. In Poland, the Gender Equality Index at level of 56.8 but, but its progress is on track with that of the European Union on average. However, the domain of power reflects the achievement of significantly more gender equality, though its score remains the lowest in Poland. Women's representation in decision-making positions has increased because the representation of women on the corporate boards of publicly listed companies has doubled (to 18 % and 22 % for Poland and European Union, respectively). The Gender Equality Index score was 63.3 in Austria in 2017, but the pace of progress in Austria was the lowest among that in the countries analysed. Considerable improvement was detected in women's representation in the economic sphere because the share of women on the boards of publicly listed companies has nearly tripled, from 6 % in 2005 to almost 18 % in 2017 (European Institute for Gender Equality, 2019b).

Further, the methodology used is presented. Although regression analysis is used to examine the relationship between stock prices and gender equality in the empirical literature, I used GMM estimations because I consider this method to be more appropriate due to the size of the dataset and the transparency of the results. First, the stationarity was verified using the Levin - Lin - Chu panel unit root test which is involved in the first generation of models based on data independence of data and identical distribution across individuals. In general, the first generation of models of panel unit root tests is based on the following univariate regression:

$$\Delta y_{it} = \rho_i y_{it-1} + z'_{it}\gamma + u_{it} \tag{1}$$

where $i = 1,2,\ldots,N$ presents the individual for each available time-series observation $t = 1,2,\ldots,T$. The deterministic components are symbolized by z_{it}, u_{it} is a stationary process, and t is a time period (Barbieri, 2006).

Following the specification of the structure Levin - Lin - Chu analysis based on the univariate regression can be a follows:

$$\Delta y_{it} = \rho y_{it-1} + \alpha_{0i} + \alpha_{1i} t + u_{it},\ i = 1,2,\ldots,N \quad t = 1,2,\ldots,T \tag{2}$$

where the time trend $(\alpha_{1i} t)$ is included. Individual effects are also involved. Deterministic components are an important source of heterogeneity in this model because the coefficient of the lagged dependent variable is restricted to be homogeneous across all units in the panel dataset. The following procedure uses t-statistic estimator to evaluate the hypothesis that each individual time series contains a unit root (i.e., $H_0 : \rho_i = \rho = 0$) against the alternative hypothesis that each time series is stationary (i.e., $H_1 = \rho_i = \rho < 0$) (Barbieri, 2006; Levin *et al.*, 2002).

The correlation analysis follows the verification of the stationarity of the time series. An important outcome of correlation analysis is the correlation coefficient to determine a linear relationship between the stock prices of the industries analysed and selected gender variables. I used the Pearson correlation coefficient, which is a parametric measure of dependence between two variables *Y* and *X*. The Pearson correlation coefficient for variables *Y* and *X* and the *T* pairs of observations can be defined as follows:

$$\hat{\rho}_{YX} = \frac{\sum_{t=1}^{T}\left(x_t - \bar{x}\right)\left(y_t - \bar{y}\right)}{\left[\sum_{t=1}^{T}\left(x_t - \bar{x}\right)^2 \sum_{t-1}^{T}\left(y_t - \bar{y}\right)\right]^{1/2}} = \frac{S_{XY}}{\left(S_{YY} S_{XX}\right)^{1/2}} \tag{3}$$

where $\hat{\rho}_{YX} \in \langle -1, 1 \rangle$, and the correlation coefficient between variables X (respective gender variables) and Y (respective stock prices) is the same as the correlation coefficient between

variables Y (respective stock prices) and X (respective gender variables), namely, $\hat{\rho}_{XY} = \hat{\rho}_{YX}$ (Cipra, 2008; Pesaran, 2015).

I now present the procedure of GMM estimations with two-stage least squares regression based on the regression model $y_t = \beta' x_t + \varepsilon_t$, where x_t is the *L x 1* vector of an explanatory variable, β presents a vector of unknown coefficients and ε_t is a random error term (Pesaran, 2015; Zivot and Wang, 2006). GMM estimation is then expressed as follows:

$$\hat{u}_{2SLS} = \hat{u} + (X - \hat{X})\hat{\beta} \tag{4}$$

where $\left(X - \hat{X}\right)$ presents the residual matrix *(T x k)* of the regressions of *X* on *Z*, and only in the case where *Z* is an exact predictor of X, will both residuals be the same (Hall, 2005; Pesaran, 2015). If the identification of the population moment condition is larger than the vector of parameter θ, the model is under-identified and is typified by a higher number of orthogonality conditions than necessary. This condition is possible to verify with 2SLS J-statistic. The criterion is as follows:

$$J(\hat{u}_{2SLS}, \hat{\sigma}^{-2} S_{xx}^{-1}) = n \frac{(s_{xy} - S_{xz}\hat{u}_{2SLS})' S_{xx}^{-1} (s_{xy} - S_{xz}\hat{u}_{2SLS})}{\hat{\sigma}^2} \tag{5}$$

where *S* is a non-singular *K x K* matrix, and if J > $\chi^2_{k-\ell}$, the null hypothesis is rejected, and the model is not valid. If J < $\chi^2_{k-\ell}$, the null hypothesis is accepted, and the model cannot be rejected (Hall, 2005; Zivot and Wang, 2006).

4. RESULTS AND DISCUSSION

The results of the correlation analysis and GMM method are presented in this section. First, the calculated correlation coefficients between the stock prices of Polish, German and Austrian food companies and the gender variables analysed are presented in Table no. 2. The stock prices of Polish food companies were significantly correlated with the factors PZP, PMP and PZDR. The stock prices of German food companies were significantly correlated with the variables PZP, PMP and PMDR. The positive correlation coefficients show that an increase in gender variables (PZP and PMDR) can cause an increase in the stock prices of Polish and German food companies. Nevertheless, the negative correlation coefficients demonstrate that an increase in gender variables (PZP, PMP, and PMDR) can cause a decrease in the stock prices of Polish and German food companies. However, the other correlation coefficients are statistically insignificant, meaning that the linear relationship between the stock prices of food companies and gender variables is not strong. For example, investors were not interested in the gender composition of boardrooms and supervisory boards but rather were interested in the profit-ability of the companies.

Table no. 2 - Correlation coefficients between the stock prices of food companies and selected gender variables

Variables	Poland	Germany	Austria
PZP	-0.2329**	0.5888*	0.2443
PMP	-0.1705***	-0.5888*	-0.2443
PZDR	0.3938*	-0.4044	-0.1657
PMDR	-0.3497	0.4044*	0.1657

Source: Authors´ calculations.

*Note: *, ** and *** denote significance at the 1 %, 5 % and 10 % levels.*

Then, the correlation coefficients between the stock prices of the Polish, German and Austrian food companies and selected gender factors are given in Table no. 3. The stock prices of the Polish metallurgical companies were significantly correlated with the variables PZP, PMP, PZDR and PMDR. The stock prices of the German metallurgical companies were significantly correlated with the factor PMDR. The stock prices of the Austrian metallurgical companies were significantly correlated with the variables PZP, PZDR and PMDR. The positive values of the correlation coefficients indicate that an increase in the values of those gender variables (PZP, PZDR, and PMDR) should lead to an increase in Polish and Austrian stock prices. The negative values of the correlation coefficients show that an increase in the values of gender factors (PZP, PMP, PZDR and PMDR) can cause a decrease in the Polish, Austrian and German stock prices of metallurgical companies. Other correlation coefficients between the stock prices of Polish, Austrian and German metallurgical companies are not statistically significant; for example, the problem of gender equality is relatively new in European markets, and investors do not have to include this information to their investment decisions.

Table no. - 3 Correlation coefficients between the stock prices of metallurgical companies and selected gender variables

Variables	Poland	Germany	Austria
PZP	0.2502*	-0.1965	-0.4185*
PMP	-0.2502*	0.2293	0.1629
PZDR	-0.4188*	0.08534	0.4354*
PMDR	0.4207*	-0.8776*	-0.4354*

Source: Authors´ calculations.

*Note: *, ** and *** denote significance at the 1 %, 5 % and 10 % levels.*

The relationships between the stock prices of energy companies and the gender variables analysed demonstrate statistically significant correlation coefficients only between the stock prices of Austrian energy companies and the variables PZP, PMP and PMDR, as shown in Table no. 4. The positive values of the correlation coefficient indicate that an increase in the values of gender variables (PZP, PZDR) should be related to increasing Austrian stock prices. The negative value of the correlation coefficient shows that an increase in the value of PMP should cause a decrease in the stock prices of Austrian energy companies. Other correlation coefficients are not statistically significant; for example, investors were interested in different types of information, such as industry specifics or macroeconomic variables.

Table no. 4 - Correlation coefficients between the stock prices of energy companies and selected gender variables

Variables	Poland	Germany	Austria
PZP	0.6107	-0.1207	0.8159*
PMP	-0.6107	0.0595	-0.8159*
PZDR	0.5271	0.1722	0.5228*
PMDR	-0.5271	-0.0292	-0.2677

Source: Authors´ calculations.
*Note: *, ** and *** denote significance at the 1 %, 5 % and 10 % levels.*

The correlation coefficients between the stock prices of chemical companies and gender factors are shown in Table no. 5. The stock prices of Polish and German chemical companies are significantly correlated with the variables PZDR and PMDR. The positive correlation coefficients indicate that an increase in the value of gender factors (PZDR and PMDR) should cause an increase in the stock prices of German and Polish chemical companies. The negative correlation coefficients show that an increase in the value of some gender factors (PZDR and PMDR) can lead to an increase in the stock prices of German and Austrian chemical companies. Other correlation coefficients are not statistically significant.

Table no. 5 - Correlation coefficients between the stock prices of chemical companies and selected gender variables

Variables	Poland	Germany	Austria
PZP	-0.2143	0.7466	-0.1085
PMP	0.2143	-0.7485	0.1621
PZDR	-0.3870*	0.8647*	0.0277
PMDR	0.3870*	-0.8647*	-0.0277

Source: Authors´ calculations.
*Note: *, ** and *** denote significance at the 1 %, 5 % and 10 % levels.*

A more in-depth analysis using GMM estimations is presented in the following tables for each industry analysed. The Sargan-Hansen test shows that the models are robust for all selected sectors. The results of the GMM method in Table no. 6 show a negative relationship between the stock prices of Polish food companies and the gender variables PZP and PMDR. However, the factor PMDR has a positive impact on the stock prices of Polish food companies. The results of GMM estimations also indicate no relationship between the gender variables analysed and the stock prices of German and Austrian food companies. Gender equality should have a positive impact on stock prices, which is consistent with theory. The negative effect of PZP can be related to the sporadic representation of women in boardrooms because there is a prevailing representation of men despite changes in these positions. These positions could be typical examples of certain rigidities; there could be a "glass ceiling" problem, or perhaps no positive aspects were considered regarding joint teams. The positive effect of PMDR on stock prices can be associated with these problems because there are traditions, habits and historical social customs in each country analysed that people consider to be normal. According to the results of GMM estimations, it is not possible to say that any of the gender variables affected the stock prices of German and Austrian food companies in the period analysed. Investors may be interested in different types of information, for example,

board members' remunerations, the transparency of companies, sector specifics, financial information, and macroeconomic variables.

Table no. 6 - Results of the GMM estimations for the food industry

Variables//Coefficients	Poland	Germany	Austria
PZP	-50.9210**	957.3758	40.3295
PMP	-11.1948	3902.784	30.1833
PZDR	-41.1776	306.0779	-0.7458
PMDR	61.8142***	54.3306	-29.7617
Effects Specification			
J-statistic, Poland	3.7563	Prob(J-statistic), Poland	0.4399
J-statistic, Germany	0.5809	Prob(J-statistic), Germany	0.4459
J-statistic, Austria	3.7308	Prob(J-statistic), Austria	0.2920
Mean dependent var, Poland	11.15240	S.E. of regression, Poland	58.04375
Mean dependent var, Germany	1.694057	S.E. of regression, Germany	78.61159
Mean dependent var, Austria	11.15240	S.E. of regression, Austria	58.43722

Source: Authors´ calculations.

*Note: *, ** and *** denote significance at the 1 %, 5 % and 10 % levels.*

In Table no. 7, we can see the results of GMM estimations for the metallurgy industry. The results demonstrate that the stock prices of Polish, German and Austrian metallurgy companies were not influenced by the gender factors analysed. Based on the results of GMM estimations, it is not possible to argue that any of the selected gender variables had an impact on the stock prices of metallurgy companies in 2005 – 2017. According to the theory, there should be a positive relationship between gender diversity and stock prices. It seems that gender variables are not important for investors or that they did not include this type of information in their investment decisions because problems of gender diversity are relatively new, and investors are interested in more general information that they may consider to be more important.

Table no. 7 - Results of the GMM estimations for the metallurgy industry

Variables//Coefficients	Poland	Germany	Austria
PZP	37.4491	63.671	-2903.454
PMP	42.7788	-319.7377	-34.2046
PZDR	-11.6366	-132.7097	-29.6398
PMDR	-41.9206	-46.0694	25.9471
Effects Specification			
J-statistic, Poland	4.7921	Prob(J-statistic), Poland	0.4417
J-statistic, Germany	6.1343	Prob(J-statistic), Germany	0.2933
J-statistic, Austria	0.6578	Prob(J-statistic), Austria	0.4173
Mean dependent var, Poland	2.240847	S.E. of regression, Poland	15.52918
Mean dependent var, Germany	2.240847	S.E. of regression, Germany	15.58836
Mean dependent var, Austria	1.694057	S.E. of regression, Austria	14.68197

Source: Authors´ calculations.

*Note: *, ** and *** denote significance at the 1 %, 5 % and 10 % levels.*

Furthermore, the results of GMM estimations for the energy industry are shown in Table no. 8. According to the GMM estimations, there is no relationship between the stock prices of energy companies and the gender variables analysed. The factors PZDR and PMDR had a negative impact on the stock prices of German and Austrian energy companies, but the relationships between PZDR and PMDR and the stock prices of Austrian energy companies are weak. Other selected gender variables did not influence the stock prices of energy companies in the period analysed. The negative impact of PZDR should be related to biases against women, the undermining of their abilities and cultural factors. Quotas can also be important factors; for example, in Austria, corporate governance codex state that females must comprise 30 % of the members of supervisory boards beginning in 2011, with this goal achieved by 2013. Similarly, in Germany, there is a 30 % quota for female representation (since the beginning of 2016), and in Poland, there is no quota for female representation on supervisory boards. Quotas could have a negative effect on stock prices because female representation could be considered to be enforced, and individuals may be of the opinion that women are in these positions only due to the quotas and that they have not enough education and experience. However, the negative impact of PMDR could be related to the prevailing representation of men or the rigidity at these positions.

Table no. 8 - Results of the GMM estimations for energy industry

Variables//Coefficients	Poland	Germany	Austria
PZP	15509.75	-3718.585	-648.9097
PMP	26689.66	-2254.338	-804.9034
PZDR	-5770.301	-509.6030*	-5873.149***
PMDR	-5852.692	-460.8597*	-5858.292***
Effects Specification			
J-statistic, Poland	3.8974	Prob(J-statistic), Poland	0.1424
J-statistic, Germany	2.5257	Prob(J-statistic), Germany	0.2828
J-statistic, Austria	1.9088	Prob(J-statistic), Austria	0.385
Mean dependent var, Poland	0.911944	S.E. of regression, Poland	14.25155
Mean dependent var, Germany	4.788830	S.E. of regression, Germany	24.46274
Mean dependent var, Austria	0.911944	S.E. of regression, Austria	87.7585

Source: Authors´ calculations.

*Note: *, ** and *** denote significance at the 1 %, 5 % and 10 % levels.*

The findings of GMM estimations for the chemical industry are shown in Table no. 9. There was no impact of the gender variables analysed on the stock prices of Polish, German and Austrian chemical companies in 2005 – 2017. According to the theory, there should be a positive relationship between gender diversity and stock prices. There is no relationship between the stock prices of chemical companies and gender factors. The finding indicates that investors did not have to be interested in the gender composition of boardrooms and supervisory boards, but information about topics including companies' market position, financial situation, and generated profit could be important to them. Despite this fact, these issues are influenced by and depend on the abilities, experiences and decisions of individuals in boardrooms and on supervisory boards, which could be related to the investors' education and ability to evaluate information.

Table no. 9 - Results of the GMM estimations for the chemical industry

Variables//Coefficients	Poland	Germany	Austria
PZP	-2883.228	1710.899	-5607.68
PMP	-2921.006	-293.5192	3.3851
PZDR	314.7904	2218.133	-114.372
PMDR	335.9789	-264.938	86.6674
Effects Specification			
J-statistic, Poland	1.3777	Prob(J-statistic), Poland	0.5021
J-statistic, Germany	1.3015	Prob(J-statistic), Germany	0.5216
J-statistic, Austria	4.6204	Prob(J-statistic), Austria	0.0992
Mean dependent var, Poland	2.866908	S.E. of regression, Poland	19.3828
Mean dependent var, Germany	2.866908	S.E. of regression, Germany	19.61784
Mean dependent var, Austria	4.788830	S.E. of regression, Austria	69.11920

Source: Authors´ calculations.
*Note: *, ** and *** denote significance at the 1 %, 5 % and 10 % levels.*

5. CONCLUSION

The objective of the paper was to examine the relationship between gender diversity in boardrooms and on the supervisory boards and the stock prices of selected publicly traded companies in 2005 – 2017. I used correlation analysis and GMM estimations to analyse the data. The correlation analysis shows a linear relationship between selected gender variables and the stock prices of some of the sectors analysed. However, a more in-depth analysis using GMM estimation confirms only some of the relations detected by correlation analysed. The findings suggest that the use of different methods is associated with different results. These results are consistent with the findings of Campbell and Minguez-Vera (2008), who showed that the use of different methods is associated with different results.

The findings also show that there are differences in the resulting relations for the individual countries and sectors analysed. Evidently, the problem of gender equality does not need be evaluated by investors in the same way in individual countries; rather, this issue should be evaluated across single industries. Using GMM estimations, we determined the negative impact of PZP on the stock prices of Polish food companies. According to the theory, there should be a positive impact of gender diversity on stock prices, which is also consistent with the findings of Gul *et al.* (2011) and Campbell and Minguez-Vera (2008). However, in the companies analysed, it is evident that the representation of men is predominant on the boards of individual companies, although in the case of Poland, it is also possible to see the presence of women, unlike in Germany and Austria, where this female representation was very sporadic. Depending on the type of investors, this finding could be evaluated negatively because positions in the governing bodies are characterized by a degree of rigidity, and the benefits of mixed teams, which are empirically documented, do not need to be into accounted for; women could face the “glass ceiling”.

Both the positive and negative effects of PMDR on the stock prices of Polish food companies and on German and Austrian stock prices are consistent with the findings of Smith *et al.* (2005), whose findings show different impacts of gender equality on stock prices. The positive impact of a higher proportion of men could be related to the historical stage of social development, customs and culture; thus, so investors would not consider the very low representation of women to be undesirable. This could be associated with bias

towards women or they could be considered weak for the job, as Haslam *et al.* (2010) claim. The negative impact of PZDR on stock prices is in accordance with the findings of Adams and Ferreira (2009), Dobbin and Jung (2011) and Ahern and Dittmar (2012). This impact could be linked to bias towards women, questions regarding their abilities, cultural aspects associated with stereotypes. The existence of quotas could also be an important factor, as since 2011, 30 % of the members of supervisory boards in Austria are required to be women, and this target must be reached by 2013 at the latest. Furthermore, compliance with the requirement of women comprising 30 % of supervisory boards is required in Germany by 2016. The implementation of quotas could have negative effects, because women's representation could be perceived as enforced and could be linked to beliefs that female members do not have sufficient education and experience (Ahern and Dittmar, 2012).

There are many cases in which there is no relationship between gender variables and the stock prices of the industries analysed; these findings are in accordance with those of Smith *et al.* (2005) and Wolfers (2006). This could be related to the fact that the gender diversity of boards is not important for investors and they evaluate other type of information. The problem of corporate governance, mainly gender equality, are relatively new and therefore do not need to be included in investors´ decisions regarding how to argue (Toudas *et al.*, 2007), which also opens the possibility of future research into this topic. The importance of gender equality confirms, for example, the findings of Ramirez (2000), who notes the growth in international trade, tightening labour markets, and a compelling need for dynamic business responses; thus, this is no time to limit equal opportunities for men and women. People offering views that are based upon unique experiences and perspectives bring value and merit to corporations to the extent that there is a dearth of such persons and to the extent that there is a growing need for such a diversity of viewpoints.

Acknowledgements

Publication of this paper was supported by the Student Grant System of Silesian University in Opava within the project SGS "The effect of fundamental factors and corporate governance on stock prices 23/2016". The support is greatly acknowledged. I am also grateful to two anonymous referees for their constructive comments and suggestions of how to improve the paper..

References

Adams, R. B., and Ferreira, D., 2009. Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics, 94*(2), 291-309. http://dx.doi.org/10.1016/j.jfineco.2008.10.007

Ahern, K. R., and Dittmar, A. K., 2012. The Changing of the Boards: The Impact on Firm Valuation of Mandated Female Board Representation. *The Quarterly Journal of Economics, 127*(1), 137-197. http://dx.doi.org/DOI:10.1093/qje/qjr049

Barbieri, L., 2006. Panel Unit Root Tests: A Review. *Working paper Serie Rossa: Economia – Quaderno, 43*. https://www.researchgate.net/publication/252756953_Panel_Unit_Root_Tests_A_Review.

Campbell, K., and Minguez-Vera, A., 2008. Gender Diversity in the Boardroom and Firm Financial Performance. *Journal of Business Ethics, 83*(3), 435-451. http://dx.doi.org/DOI:10.1007/s10551-007-9630-y

Catalyst, 2019. Women in Management: Quick Take. from https://www.catalyst.org/research/women-in-management/

Cipra, T., 2008. *Financni ekonometrie* (1st ed. ed.). Prague: Ekopress.

Dezso, C. L., and Ross, D. G., 2012. Does Female Representation in Top Management Improve Firm Performance? A Panel Data Investigation. *Strategic Management Journal, 33*(9), 1072-1089. http://dx.doi.org/DOI:10.1002/smj.1955

Dobbin, F., and Jung, J., 2011. Corporate Board Gender Diversity and Stock Performance: The Competence Gap or Institutional Investor Bias? *North Carolina Law Review, 89*(3), 809-838.

European Institute for Gender Equality, 2019a. Gender Equality Index. from https://eige.europa.eu/gender-equality-index/2015/countries-comparison

European Institute for Gender Equality, 2019b. Gender Equality Index Publications. from https://eige.europa.eu/gender-equality-index/publications

European Institute for Gender Equality, 2019c. Gender Statistics Database. from https://eige.europa.eu/genderstatistics/dgs/indicator/wmidm_bus_bus__wmid_comp_compbm/bar

Gul, F. A., Srinidhi, B., and Ng, A. C., 2011. Does Board Gender Diversity Improve the Informativeness of Stock Prices? *Journal of Accounting and Economics, 51*(3), 314-338. http://dx.doi.org/DOI:10.1016/j.jacceco.2011.01.005

Hall, A. R., 2005. *Generalized Method of Moments* (1st ed. ed.). New York: Oxford University Press.

Haslam, S. A., Ryan, M. K., Kulich, C., Trojanowski, G., and Atkins, C., 2010. Investing with Prejudice: The Relationship Between Women's Presence on Company Boards and Objective and Subjective Measures of Company Performance. *British Journal of Management, 21*(2), 484-497. http://dx.doi.org/DOI:10.1111/j.1467-8551.2009.00670.x

Levin, A., Lin, C. H. F., and Chu, C. H. S. J., 2002. Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties. *Journal of Econometrics, 108*(1), 1-24. http://dx.doi.org/DOI:10.1016/S0304-4076(01)00098-7

Pesaran, M. H., 2015. *Time Series and Panel Data Econometrics* (1st ed. ed.). Oxford: Oxford University Press. http://dx.doi.org/DOI:10.1093/acprof:oso/9780198736912.001.0001

Ramirez, S. A., 2000. Diversity and the Boardroom. *Stanford Journal of Law, Business & Finance, 6*(1), 85-134.

Smith, N., Smith, V., and Verner, M., 2005. Do Women in Top Management Affect Firm Performance? A Panel Study of 2 500 Danish Firms. *International Journal of Productivity and Performance Management, 55*(7), 569-593. http://dx.doi.org/DOI:10.1108/17410400610702160

The World Bank, 2019. World Bank Open Data. from https://data.worldbank.org/indicator/SL.TLF.CACT.FE.ZS?end=2017&locations=AT-DE-PL&name_desc=false&start=2005

Toudas, K., Bellas, A., and Makridis, G., 2007. Corporate Governance and its Effect on Firm Value and Stock Returns of Listed Companies on the Athens Stock Exchange. *European Research Studies Journal, 17*(2), 58-80.

Wolfers, J., 2006. Diagnosing Discrimination: Stock Returns and CEO Gender. *Journal of the European Economic Association, 4*(2-3), 531-541. http://dx.doi.org/DOI:10.1162/jeea.2006.4.2-3.531

Zdeněk, D., and et al., 2014. *Ženy a management, Kreativita – inovace – etika – kvalitativní management*. Brno: BizBooks.

Zivot, E., and Wang, J., 2006. *Modeling Financial Time Series with S-PLUS* (2nd ed. ed.). New York: Springer.

Copyright